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| APPLICATION NO.                                 | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------|------------------|
| 10/665,259                                      | 09/22/2003  | Gang Wang            | 031185              | 7118             |
| 23850   | 7590        | 11/25/2005           | EXAMINER            |                  |
| ARMSTRONG, KRATZ, QUINTOS, HANSON & BROOKS, LLP |             |                      | LEE, PATRICK J      |                  |
| 1725 K STREET, NW                               |             |                      | ART UNIT            | PAPER NUMBER     |
| SUITE 1000                                      |             |                      |                     |                  |
| WASHINGTON, DC 20006                            |             |                      | 2878                |                  |

DATE MAILED: 11/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

|                 |                            |  |
|-----------------|----------------------------|--|
| Application No. | 10/665,259                 |  |
| Examiner        | Art Unit<br>Patrick J. Lee |  |
|                 | 2878                       |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

1) Responsive to communication(s) filed on 22 September 2003.  
2a) This action is FINAL.                            2b) This action is non-final.  
3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

4) Claim(s) 1-42 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) Claim(s) \_\_\_\_\_ is/are allowed.  
6) Claim(s) 1-42 is/are rejected.  
7) Claim(s) 1,17, 19 and 31 is/are objected to.  
8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

9) The specification is objected to by the Examiner.  
10) The drawing(s) filed on 22 September 2003 is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) All    b) Some \* c) None of:  
1. Certified copies of the priority documents have been received.  
2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

1) Notice of References Cited (PTO-892)  
2) Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 09222003.

4) Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.  
5) Notice of Informal Patent Application (PTO-152)  
6) Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Priority***

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Specification***

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

### ***Drawings***

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the p-n junction between the first semiconductor layer and the third semiconductor layer as stated in claims 2-3 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering

of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the examiner does not accept the changes, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Objections***

4. Claims 1, 17, & 31 are objected to because of the following informalities:

With respect to claims 1, 17, & 31, all three claims refer to a "semiconductor layer" that is formed on a substrate and includes at least one semiconductor layer. The wording as such seems awkward, for it appears to be stating the obvious (that a semiconductor layer has a semiconductor layer). In addition, it is vague as to how a substrate can have a first and second surface that faces each other.

Appropriate correction is required.

5. Claim 19 recites the limitation "potential" in claim 5. There is insufficient antecedent basis for this limitation in the claim. It will be assumed that claim 19 is instead dependent on claim 17.

***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States

only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1, 4, 7, 10-12, & 14-15 are rejected under 35 U.S.C. 102(e) as being anticipated by US 6,894,267 B2 to Kakinuma.

With respect to claim 1, Kakinuma discloses a photodetector device comprising: substrate (100); n-type blocking layer (123) as a first semiconductor layer of a first conductivity type; light-absorbing layer (125) that is formed on n-type blocking layer (123) and generates carriers in accordance with incident light; p-type blocking layer (127) as a second semiconductor layer of a second conductivity type; electrode (140) as a first electrode part electrically connected to first semiconductor layer (123); electrode (150) as a second electrode part electrically connected to a second semiconductor layer (127); and p-type blocking layer (117) as a third semiconductor layer of the second conductivity type interposed between first surface of substrate (100) and first semiconductor layer (123).

With respect to claim 4, Kakinuma discloses n-type blocking layer (113) as a fourth semiconductor layer of a first conductivity, such that the third semiconductor layer (117) is interposed between first semiconductor layer (123) and fourth semiconductor layer (113).

With respect to claim 7, Kakinuma discloses contact layer (130) to be in touch with second electrode (150).

With respect to claims 10-11, Kakinuma illustrates a mesa structure and also discloses optical waveguide layers (160, 162, 170, 172) to allow for light to enter through a side surface.

With respect to claim 12, Kakinuma illustrates the first semiconductor layer (123) exposed at the bottom of the mesa structure and first electrode (150) being formed on the exposed surface and second electrode (140) being formed on the second semiconductor layer.

With respect to claim 14, Kakinuma discloses the first semiconductor layer (123) as an n-type InP layer and second semiconductor layer (125) as a p-type InP layer (see column 6, lines 48-58).

With respect to claim 15, Kakinuma discloses light absorption layer (125) as an InGaAs layer (see column 6, lines 52-55).

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 2-3, 5-6, 7-9, 13, & 16-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,894,267 B2 to Kakinuma.

Kakinuma discloses the invention as described in the discussion of claims 1, 4, 7, 10-12, & 14-15.

With respect to claims 2-3, 5, 17-19, & 30, Kakinuma doesn't explicitly disclose the use of a capacitor, but such would have been obvious to one of ordinary skill in the art in order to allow the device to hold the charges detected by the light absorption layer.

With respect to claims 6 & 8, the modified Kakinuma does not explicitly disclose the use of a contact layer and a buffer layer for first semiconductor layer (123), but such would have been obvious to one of ordinary skill in the art in order to ensure the integrity of the charges detected.

With respect to claim 9, the modified Kakinuma does not explicitly disclose the use of graded layers, but such would have been obvious to one of ordinary skill in the art in order to allow for the selective generation of charges based on the wavelengths detected.

With respect to claim 13, the modified Kakinuma does not explicitly disclose the use of an avalanche photodiode, but such would have been obvious to one of ordinary skill in the art to utilize an avalanche photodiode because such would allow for stable control of the gain in giving the device additional sensitivity.

With respect to claim 16, the modified Kakinuma does not explicitly disclose the use of a certain impurity concentration, but such would have been obvious to one of

ordinary skill in the art because it would allow for the passage of charges without adverse effects from a high doping concentration.

With respect to claims 20 & 22, the modified Kakinuma does not explicitly disclose the use of a contact layer and a buffer layer for first semiconductor layer (123), but such would have been obvious to one of ordinary skill in the art in order to ensure the integrity of the charges detected.

With respect to claim 21, the modified Kakinuma discloses contact layer (130) to be in touch with second electrode (150).

With respect to claim 23, the modified Kakinuma does not explicitly disclose the use of graded layers, but such would have been obvious to one of ordinary skill in the art in order to allow for the selective generation of charges based on the wavelengths detected.

With respect to claims 24-25, the modified Kakinuma illustrates a mesa structure and also discloses optical waveguide layers (160, 162, 170, 172) to allow for light to enter through a side surface.

With respect to claim 26, the modified Kakinuma illustrates the first semiconductor layer (123) exposed at the bottom of the mesa structure and first electrode (150) being formed on the exposed surface and second electrode (140) being formed on the second semiconductor layer.

With respect to claim 27, the modified Kakinuma does not explicitly disclose the use of an avalanche photodiode, but such would have been obvious to one of ordinary

skill in the art to utilize an avalanche photodiode because such would allow for stable control of the gain in giving the device additional sensitivity.

With respect to claim 28, the modified Kakinuma discloses the first semiconductor layer (123) as an n-type InP layer and second semiconductor layer (125) as a p-type InP layer (see column 6, lines 48-58).

With respect to claim 29, the modified Kakinuma discloses light absorption layer (125) as an InGaAs layer (see column 6, lines 52-55).

11. Claims 31-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,894,267 B2 to Kakinuma in view of US 6,043,550 to Kuhara et al.

With respect to claims 31-32, Kakinuma discloses a photodetector device comprising: substrate (100); n-type blocking layer (123) as a first semiconductor layer of a first conductivity type; light-absorbing layer (125) that is formed on n-type blocking layer (123) and generates carriers in accordance with incident light; p-type blocking layer (127) as a second semiconductor layer of a second conductivity type; electrode (140) as a first electrode part electrically connected to first semiconductor layer (123); electrode (150) as a second electrode part electrically connected to a second semiconductor layer (127); and p-type blocking layer (117) as a third semiconductor layer of the second conductivity type interposed between first surface of substrate (100) and first semiconductor layer (123). However, Kakinuma does not disclose the use of a metal layer and a dielectric layer interposed between the metal layer and the second surface of a substrate. Kuhara et al disclose such a device comprising substrate (266), with antireflection layer (280) as a dielectric layer and a metallized ring (275) as a metal

layer. To modify the teachings of Kuhara et al with those of Kakinuma would have been obvious to one of ordinary skill in the art in order to ensure the ability of the device to obtain as accurate detection of the light as possible.

With respect to claims 33 & 35, the modified Kakinuma does not explicitly disclose the use of a contact layer and a buffer layer for first semiconductor layer (123), but such would have been obvious to one of ordinary skill in the art in order to ensure the integrity of the charges detected.

With respect to claim 34, the modified Kakinuma discloses contact layer (130) to be in touch with second electrode (150).

With respect to claim 36, the modified Kakinuma does not explicitly disclose the use of graded layers, but such would have been obvious to one of ordinary skill in the art in order to allow for the selective generation of charges based on the wavelengths detected.

With respect to claims 37-38, the modified Kakinuma illustrates a mesa structure and also discloses optical waveguide layers (160, 162, 170, 172) to allow for light to enter through a side surface.

With respect to claim 39, the modified Kakinuma illustrates the first semiconductor layer (123) exposed at the bottom of the mesa structure and first electrode (150) being formed on the exposed surface and second electrode (140) being formed on the second semiconductor layer.

With respect to claim 40, the modified Kakinuma does not explicitly disclose the use of an avalanche photodiode, but such would have been obvious to one of ordinary

skill in the art to utilize an avalanche photodiode because such would allow for stable control of the gain in giving the device additional sensitivity.

With respect to claim 41, the modified Kakinuma discloses the first semiconductor layer (123) as an n-type InP layer and second semiconductor layer (125) as a p-type InP layer (see column 6, lines 48-58).

With respect to claim 42, the modified Kakinuma discloses light absorption layer (125) as an InGaAs layer (see column 6, lines 52-55).

### ***Conclusion***

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patrick J. Lee whose telephone number is (571) 272-2440. The examiner can normally be reached on Monday through Friday, 8:00 am to 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Epps can be reached on (571) 272-2328. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Patrick J. Lee  
Examiner  
Art Unit 2878

PJL  
November 22nd, 2005



Stephone B. Allen  
Primary Examiner